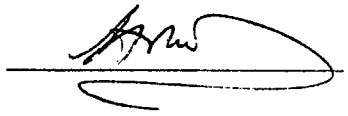
DECLARATION

I, JOHN ALFRED RICHES, of Oak Farm, Catfield, Great Yarmouth, Norfolk, England, do hereby declare that I am conversant with the English and French languages and am a competent translator thereof. I declare further that the following is a true and correct translation made by me of the original text of the specification of European Patent (U.K.) No. 612,119.

Signed this 4th day of February, 2002.



DESCRIPTION

The present invention relates to a car glazing provided with a conductor structure placed on a glass surface, which comprises conductors which are printed and baked in situ on said glass surface, as well as other conductors, placed in a second plane and insulated from the first conductors.

Car glazings equipped with electrical conductors baked in situ in the surface of the glass and formed from a baking ink containing metallic silver are used more particularly as heated glazings (DE-AS 19 11 561) or as aerial-equipped glazings (DE 21 45 968 C3). Car glazings are also known equipped with a conductor structure baked in situ and where in said structure there is an alarm loop connected to a signal transmitter (BE 418 123 A1). It is also known that it is possible to produce conductor structures baked in situ in the glass surface in the form of moisture detectors (German patent 22 07 230) and to directly place on the glass surface, in the form of in situ baked, conductor structures, inductance coils, capacitors and shielding cables (DE 20 14 643).

In practice, conductor structures on glass surfaces are normally printed by screen process printing and baked in situ at a high temperature. using this procedure, it is possible to obtain at a lower cost, relatively complex conductor structures in a single plane.

However, in a large number of cases it is not sufficient to remain in one plane. For example, in the case of crossings of conductors, where the latter must be insulated from one another, said conductors must be placed in different planes at the crossing points. DE 25 52 049 B2 discloses a system of conductors, which cross one another and are insulated from one another. With this known system of conductors, the crossing problem is solved as a result of the fact that the in situ baked, conductive connection surfaces are connected by insulated conductor sections of the conductor, which are bent to a bridge shape and which are mechanically strong. They pass above the in situ baked conductors and cross the same so as to form an arc or semicircle.

With the aid of printing methods, it is known that multilayer conductive tracks can be formed with insulating layers placed between the conductive layers and this takes place in several successive printing operations (DE 39 11 178 C2). However, this process only gives satisfactory results if each layer is separately baked after the printing operation. In the manufacture of car glazings, such a multiple baking is impossible for economic reasons and also for technical reasons. In practice, in the production of multiple layers on car glazings, there is simply an intermediate drying after each printing operation and, after the final printing operation, the complete set of layers is baked in situ in a single operation. However, with this

process, short-circuits occur without interruption at the crossing points, so that this method gives rise to a considerable amount of waste.

The object of the invention is to provide a car glazing equipped with conductors partly extending in at least two planes and where the risk of short-circuits at the conductor crossing points is reliably prevented and where simple manufacture is possible under conventional production conditions.

According to the invention, this object is achieved in that the car glazing, provided with a system of conductors placed on a glass surface and having a first series of conductors which are printed and baked in situ on said glass surface and a second series of conductors or at least one electronic module fixed to the glass surface, as well as crossing conductors placed in a plane different to that of the conductors of the first series and constituted by conductive metal wires or strips permanently fixed by an adhesive layer to said glass surface and which pass above the conductors of the first series whilst being electrically insulated from the latter, is characterized in that the crossing conductors are used for the electrical connection of the conductors of the second series to a terminal connection conductive structure, or are used for electrically connecting the electronic module to a connection cable, and the crossing conductors are located within a prefabricated, multilayer element comprising on the one hand an insulating sheath surrounding said crossing conductors, at least in the crossing region with the conductors of the first series, and on the other hand appropriate connection surfaces for electrical connection between the crossing conductors and the terminal connection conductive structure and/or connection cable, of a multilayer, prefabricated element, comprising at least one insulating layer, which is permanently fixed by an adhesive coating to the surface of the glazing provided with the in situ baked conductors and above the latter.

The necessary conductors or systems or structures of conductors in a second plane and, if applicable, in other conductor planes, are therefore prefabricated, according to the invention, on a support formed by a monolayer or multilayer, insulating film and the prefabricated, multilayer elements are applied by rolling at the desired location of the glass surface at the end of the glazing production process. The prefabricated elements are provided with appropriate connection surfaces, e.g. welding connection surfaces, which make it possible to electrically connect the conductors of the prefabricated element to the in situ baked conductor system and/or to connection cables.

Embodiments of the invention are described in greater detail hereinafter with reference to the attached drawings, wherein show:

Fig. 1 Part of a glazing provided with heating conductors with a clearing of the conductors according to the invention.

Fig. 2 A sectional view along line II-II of fig. 1.

Fig. 3 Part of a car glazing provided with heating conductors with an electronic module placed in the heating zone and an element crossing the heating conductors and which is bonded to the surface of the glass.

Fig. 4 A sectional view along line IV-IV of fig. 3.

Figs. 1 and 2 show a first embodiment of a car glazing according to the invention. The car glazing shown in part here is an electrically heated rear window in which the horizontal, heating conductors (2) are printed and baked in situ on the glass (1) and also have one or more aerial or antenna conductors galvanically separated from the heating conductors (2) and which are also printed and baked in situ. The aerial conductors are not shown in the drawings. The aerial conductor is placed above the heating conductor (2) and is connected to a plugging element (3) identical to a pushbutton and which is fixed close to the lower edge of the glass surface (1), i.e. below the heating conductor (2) and to which is connected the cable leading to the aerial amplifier or receiver.

The passage above the heating conductor (2) takes place by means of the separate, multilayer element (6), which has as the electricity conductor component a thin metal strip (7), whose thickness is e.g. 30 to 80 µm and which is 1 to 10 mm wide. In place of the metal strip (7), the electricity conducting component can also be a diameter 0.1 to 1 mm copper wire. The metal strip (7), which is preferably of copper, is surrounded by a flat insulating sheath (8) of an appropriate, fracture-resistant plastics material. The lower end of the element (6) widens into a circular, terminal section (10) having a central welding eyelet (11). Close to the welding eyelet (11), the insulating sheath (8) is eliminated above and below the metal strip (7), forming a circular, freed space, and the metal ribbon (7) has a concentric hole (12). The element (6) is bonded to the glass plate (10 by an adhesive coating (13).

The material for the insulating sheath (8) of element (6) and which is permanently and durably fixed to the metal ribbon (7) is a polyimide-based plastics material and which e.g. proves satisfactory, whereas the adhesive for fixing said element to the glass surface is in particular formed by an isoprene or acrylate-based adhesive, each of which has proved satisfactory.

The circular, terminal section (10) of the element (6) rests on a tin-

weldable, conductive enamel coating (15) which is e.g. constituted by the same baking ink as the heating conductors (2) and the aerial conductor and which has been applied to the glass surface during the same printing operation as for the latter. The pushbutton-like plugging element on the one hand and the welding eyelet (11) of the element (6) on the other are tin-welded to said conductive enamel coating (15). Welding between the welding eyelet (11) and the conductive enamel coating (15) takes place after putting the element (6) into place on the glazing (1), by depositing a tin-weld (16) at the location of the welding eyelet (11), it flows through the hole (12) of the metal ribbon (7) and is welded to the conductive enamel coating (15).

Figs. 3 and 4 show another embodiment of the invention. This is also a car glazing which can be electrically heated using heating conductors (19) printed and baked in situ on the glazing (18). An electronic module has to be fixed to the glass in the heated surface area. This electronic module can be a moisture detector or any random electronic assembly. The conductors leading to said module, which is not shown in the drawings, must preferably be led in an esthetically appropriate manner to the upper edge of the glazing (18), where connection takes place of a compact cable ensuring the remainder of the connection.

In this case, the crossing of the heating conductors (19) takes place by means of a complex element (20), which is laminated or bonded to the glazing (18). At one of its ends, said element (20) has a mounting surface (21) intended for the module and, at its other end, a mounting surface (22) intended for a plugging element for bringing about the connection to the compact cable. At the location of the mounting surface (21), the electronic module can be directly integrated with the element (20) or, as a separate module, can be placed on the mounting surface (21) at a later time. If appropriate, the plugging element can, at the location of the mounting surface (22), be integrated into the element (20) or can be placed on said mounting surface (22) at a later time. The element (20) has three conductors, namely a supply conductor (24), a signalling or indicating conductor (25) and a control conductor (26), which are connected at the corresponding connection points to the mounting surfaces (21 and 22).

Fig. 4 shows the multilayer structure of the element (20). Besides the supply conductor (24), signalling conductor (25) and control conductor (26) which, in this case, are placed in one plane, between two insulating layers (27), in the interior of an adhesive coating (28), the element (20) has below the plane of the conductors, a metal sheet (29) preferably extending over the entire width of element (20). This metal sheet (29) is connected to the earth terminal (30) on the mounting surface (21). The metal sheet (29) serves as an earth conductor and at the same time as a shielding conductor. Above the upper insulating layer (27) is another adhesive coating (28), in

the centre of which is placed another metal strip (32) serving as the upper shielding conductor for the underlying signalling conductor (25). All the layers are surrounded by an insulating sheath (34) made from a fracture-resistant, plastics material, e.g. based on polyimide. This element (20) is strongly and permanently bonded to the surface of the glazing (18) by means of an adhesive coating (35).

Multilayer structures of this type are known in the printed circuit board procedure as multilayers. The conductors can be produced according to printing processes, by printing insulating sheets (17), by applying thin metal strips, by doubling or overlaying on insulating sheets (27), or by doubling or overlaying an insulating sheet over its entire surface by means of a copper sheet and structuring the latter using chemical etching. With the aid of such known procedures, it is possible to produce a flat cable and, by stamping or hot shaping, from said flat cable the element (20) is obtained in its desired shape and form. Following the manufacture of the glazing (18), the element (20) is bonded to the surface of said glazing.

CLAIMS

1. Car glazing having a system of conductors placed on a glass surface (1, 18) and comprising

- a first series of conductors (2, 19), which are printed and baked in situ on said glass surface (1, 18) and a second series of conductors, which are printed and baked in situ on said glass surface or at least one electronic module fixed to said glass surface,
- crossing conductors (7, 24, 25, 26, 29, 32) placed in a different plane from that of the conductors (2, 19) of the first series and constituted by conductive, metal strips or wires permanently fixed by an adhesive coating (13, 35) to said glass surface (1, 18) and which pass above the conductors (2, 19) of the first series, whilst being electrically insulated from the latter, characterized in that
- the crossing conductors (7, 24, 25, 26, 29, 32) are used for electrically connecting the conductors of the second series to a conductive, in situ baked, terminal, connection system or are used for electrically connecting the electronic module to a connection cable,
- the crossing conductors (7, 24, 25, 26, 29, 32) are located within a multilayer, prefabricated element (6, 20) comprising on the one hand an insulating sheath (8, 34) surrounding said crossing conductors, at least in the crossing region with the conductors (2, 19) of the first series and on the other hand appropriate connection surfaces for the electrical connection between the crossing conductors and the conductive, terminal, connection structure and/or to the connection cable.

2. Car glazing according to claim 1, characterized in that the prefabricated element (20) comprises metal, conductive strips or wires (24, 25, 26, 29, 32) located in several planes and separated from one another by the interposing of insulating layers (27).

3. Car glazing according to claim 1 or 2, characterized in that the metal strips (24, 25, 26, 29, 32) have a thickness of 30 to 80 µm and a width of 1 to 10 mm.

4. Car glazing according to one of the claims 1 to 3, characterized in that the adhesive coating (13, 35) is based on isoprene or acrylate.

5. Car glazing according to one of the preceding claims, characterized in that the prefabricated, multilayer element (6) is provided, at least at one of its ends, with an eyelet (11) for the connection by tin welding to a conductive layer (15) baked in situ on the glass surface.

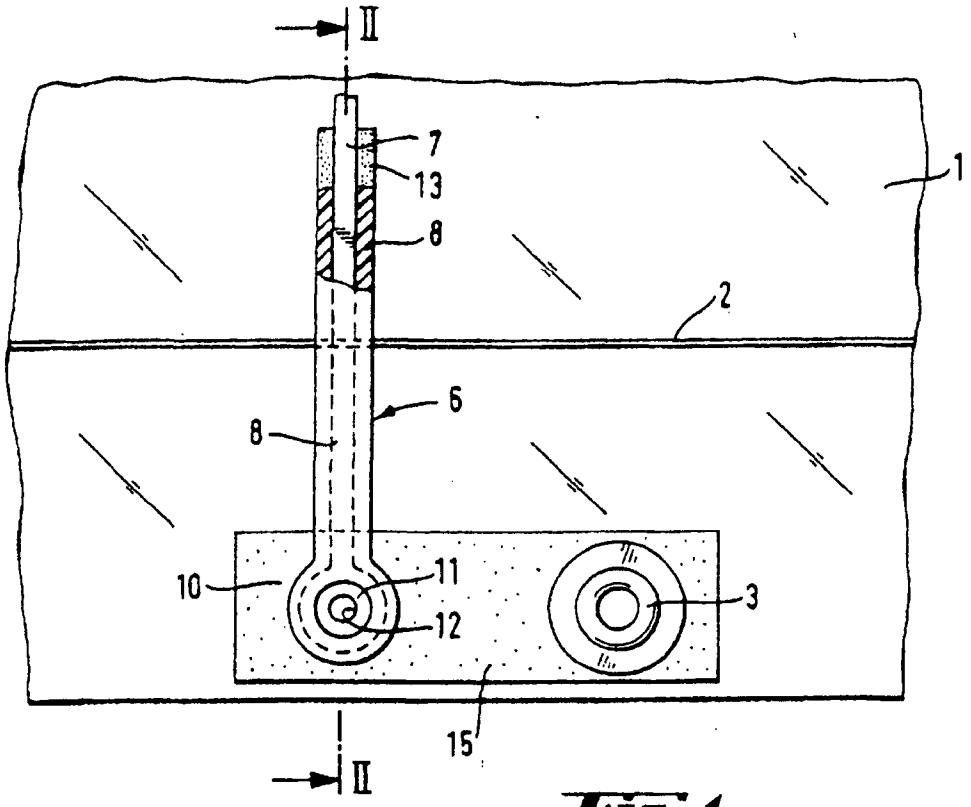


Fig. 1

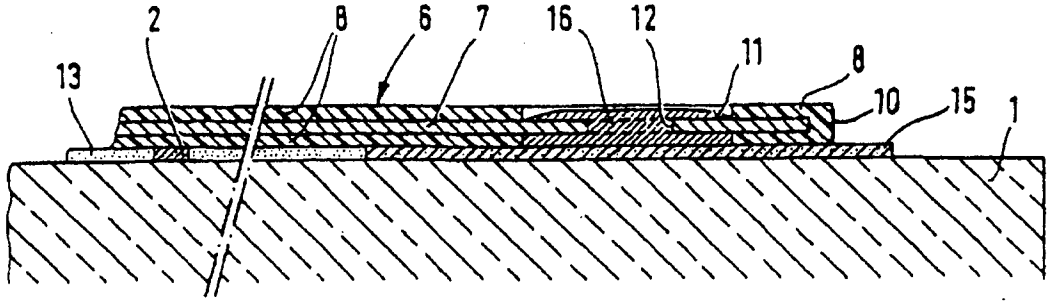


Fig. 2

Fig. 3

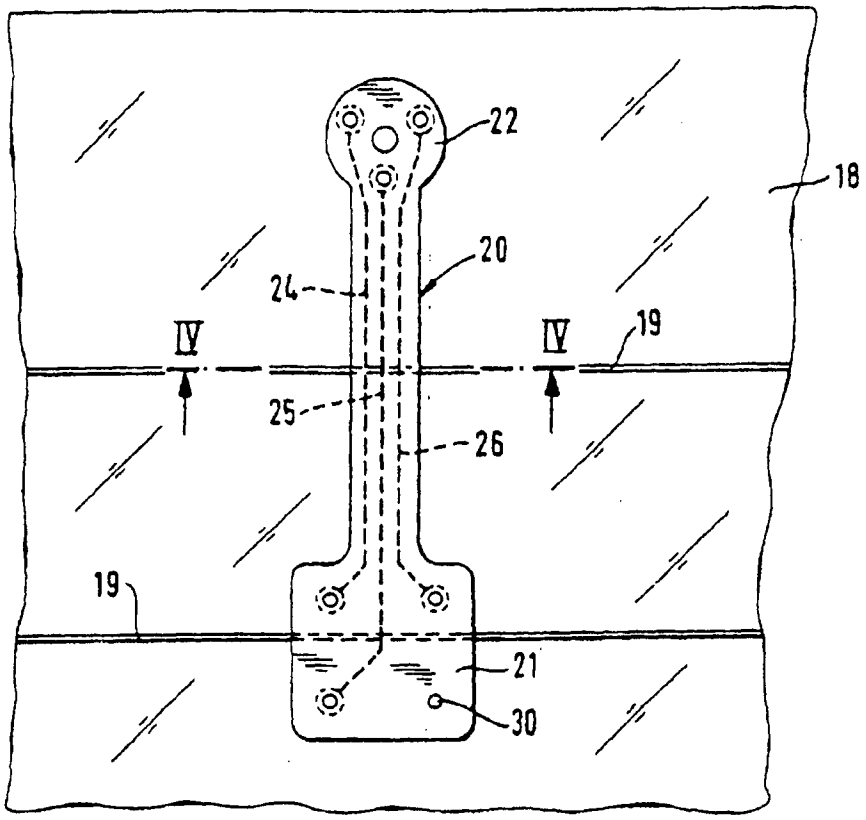
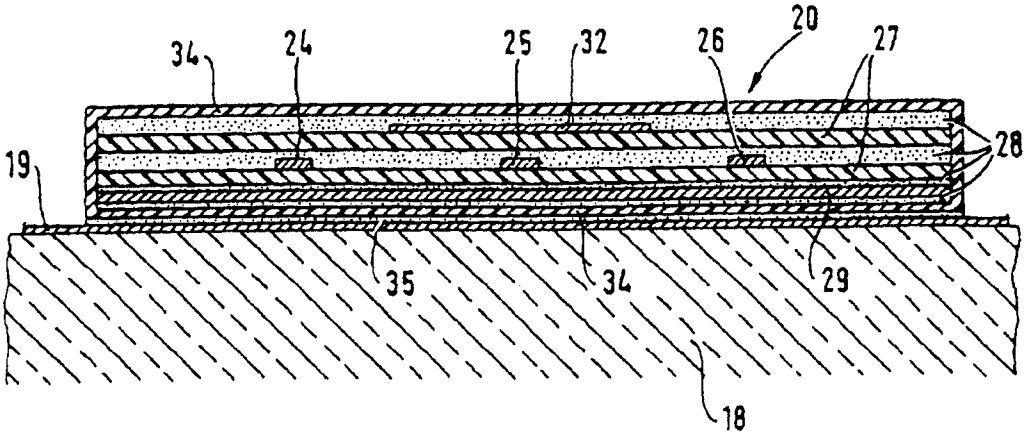

22
18
20
24
IV
IV
19
25
26
19
21
30

Fig. 4


20
34
24
25
32
26
27
28
19
35
34
29
18